

**INDIANA DEPARTMENT OF TRANSPORTATION  
OFFICE OF MATERIALS MANAGEMENT**

**PROCEDURE FOR BENCH TESTING, FIELD TESTING, AND APPROVAL LIST  
REQUIREMENTS FOR TRAFFIC CONTROLLER CABINET COMPONENTS  
ITM No. 932-08P**

**1.0 SCOPE.**

- 1.1** This test procedure covers the methods which traffic controller cabinet components are bench tested, evaluated in the field, and placed, maintained, or removed from an approval list.
- 1.2** The values stated in either English or acceptable SI metric units are to be regarded separately as standard, as appropriate for a specification with which this ITM is used. Within the text, SI metric units are shown in parenthesis. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other, without combining values in any way.
- 1.3** This ITM may involve hazardous materials, operations, and equipment and may not address all of the safety problems associated with the use of the test method. The user of the ITM is responsible for establishing appropriate safety and health practices and determining the applicability of regulatory limitations prior to use.

**2.0 REFERENCES.**

**2.1 Industry Standards.**

2003 NEMA Standards Publication TS-2 Traffic Signal Controller Assemblies

NTCIP 1210, Object Definitions for Signal System Masters

**3.0 TERMINOLOGY.** Definitions for terms and abbreviations shall be in accordance with the Department's Standard Specifications, Section 101 and NEMA TS-2 Section 1.

- 3.1** Abbreviations. Where the following abbreviations are used in this ITM, they are to be construed the same as the respective expressions represented.

BIU	Bus Interface Unit
MMU	Conflict Monitor / Malfunction Management Unit

#### **4.0 SIGNIFICANCE AND USE.**

- 4.1** This ITM is used to evaluate, approve, maintain approval, and remove from the approval listing traffic controller cabinet components placed on the Department List of Approved Traffic Controller Equipment. Each model and type of the components will be bench tested and field tested separately.
- 4.2** The NEMA TS-2 cabinet components for which this ITM is applicable to are BIU, MMU, Backpanel, Cabinet Power Supply, Controller, Loop Amplifier, Counting Loop Amplifier, Load Switches, Flashers, and Field Master Controller.

#### **5.0 APPARATUS.**

- 5.1** Complete TS-2 fully functional controller assembly compatible with the submitted NEMA TS-2 component.
- 5.2** ATSI BUS INTERFACE UNIT, tester model # BIUT-800
- 5.3** ATSI Conflict Monitor / Malfunction Management Unit, tester model # PCMT-2500, 2600, or equivalent tester
- 5.4** ATSI TS-2 Loop Amplifier, tester model # ALSA-1250

#### **6.0 SAMPLING.**

- 6.1** The manufacturer shall furnish, at no cost to the Department, one randomly selected production-run cabinet component of each model and type for bench testing and field testing.

#### **7.0 PROCEDURE.**

- 7.1** The manufacturer of the material shall submit the Preliminary Product Material Evaluation Form (Appendix A) for each model or type of cabinet component, which the manufacturer is requesting to be added to the Approved List.
- 7.2** The manufacturer shall submit with the Evaluation Form the following:
  - 7.2.1** An invoice showing an initial zero dollar amount (\$0.00) for the use of the evaluation sample material during the evaluation. The invoice shall also list the deferred cost of the material that the Department would pay if the material is purchased instead of returned upon the successful completion of the evaluation.

- 7.2.2** A certification of environmental testing with each major unit approval request indicating that the material has been tested and is in accordance with the environmental requirements from NEMA TS-2. The certification shall specify the model and serial number of the component tested. A complete log of each test shall be provided to the Department and will be maintained by the Department. The log shall show which, if any, component failed during the test, when the component failed, and what steps were taken to repair the component. The log shall include the date of testing, name and title of person conducting the tests, a record of conditions throughout the tests, and a temperature and humidity verses time chart. The maximum report interval of any chart shall be 24 h. The chart shall be from a recording machine used to monitor the status of the environmental chamber during testing.
- 7.2.3** Operation and Maintenance Manual(s), including theory of operation, schematics and cabinet components parts listing
- 7.2.4** One randomly selected production run cabinet component for bench testing and field testing
- 7.2.5** List of required software and any additional items required to realize full potential of product

**8.0 SUBMITTAL REVIEW.** The documentation, including the environmental testing, will be reviewed for usability of the cabinet component with Department approved NEMA TS-2 traffic controller assemblies. The manufacturer's recommended schedule and extent of maintenance will be reviewed for acceptability.

**9.0 BENCH TESTING.**

- 9.1** The components will be bench tested for compatibility with all NEMA TS-2 signal controller assemblies used by the Department. Each of the components will be verified for full NEMA TS-2 functionality and full manufacturer's claimed optional functionality.
- 9.2** BIU components NEMA specified tolerances will be verified using a ATSI BUS INTERFACE UNIT (BIU) tester model # BIUT-800 in accordance with manufacturer's operating procedures.
- 9.3** MMU components NEMA specified tolerances will be verified using a ATSI Conflict Monitor / Malfunction Management Unit (MMU) tester model # PCMT-2500 in accordance with manufacturer's operating procedures.

- 9.4 The TYPE I or II, Controller will be verified for full NEMA TS-2 functionality and full manufacturer's claimed optional functionality. NTCIP 1202 compatibility shall be defined as including and supporting all mandatory and optional object definitions.
- 9.5 The loop amplifier will be verified for full NEMA TS-2 functionality and full manufacturer's claimed optional functionality. NEMA specified tolerances will be verified using a ATSI TS-2 CARD RACK COUNTING Loop Amplifier tester model # ALSA-1250 in accordance with manufacturer's operating procedures. All loop amplifier units will be tested for compliance with NEMA TS2-Section 6, shall be type C, 2-channels with delay and extend, as stated in NEMA TS2-6.5.2.2.1. In addition, loop amplifiers shall have an LCD display or a RS-232 software interface capable of displaying loop status, diagnostics, and all amplifier settings and operating parameters.
- 9.6 The TS-2 Card Rack Counting Loop Amplifier will be verified for full NEMA TS-2 functionality and full manufacturer's claimed optional functionality. NEMA specified tolerances will be verified using a ATSI TS-2 Card Rack Counting Loop Amplifier tester model # ALSA-1250 in accordance with manufacturer's operating procedures. All loop amplifier units will be tested for compliance with NEMA TS2-Section 6 and shall be type C, 2-channels with delay and extend as stated in NEMA TS2-6.5.2.2.1. Loop amplifiers shall have an LCD display or a RS-232 software interface capable of displaying loop status, diagnostics, and all amplifier settings and operating parameters. All amplifiers designated for counting purposes shall be two channel counting amplifiers capable of transmitting channel 1 and 2 presence states on the channel 1 and 2 output edge connections, and channel 1 and 2 count pulses on the edge connection assigned to channel 3 and 4 outputs. The status output of each active counting channel (3 or 4) must be set to logic ground by software configuration within the amplifier
- 9.7 The Field Master Controller will be verified for full NEMA TS-2 functionality and full manufacturer's claimed optional functionality. NTCIP 1210 compatibility shall be defined as including and supporting all mandatory and optional object definitions and must be compatible with all NTCIP secondary controllers used by the Department.

**10.0 FIELD TESTING.** The field testing of the component will consist of installing the cabinet component in an actual traffic signal system for a period of up to 12 months to monitor the following:

- 10.1 Any failures for the component
- 10.2 The relative ease of use for the field personnel
- 10.3 Overall build quality and expected lifecycle of the cabinet component. This requirement shall be comparable with existing approved components.

**11.0 REPORT.** A final report will include the notations and findings from the electronic bench test and field testing results and documentation.

## **12.0 APPROVAL LIST**

**12.1 Approval of Cabinet Component.** The cabinet component model may be placed on the approval list when the following conditions are met:

**12.1.1** A potential net benefit to the Department is realized by inclusion of the item on the list

**12.1.2** The unit passes the NEMA TS-2 environmental requirements

**12.1.3** The required documentation is submitted

**12.1.4** The bench and field testing are completed with satisfactory results

**12.1.5** No excessive amount of routine or periodic maintenance is required

**12.1.6** No failure with any of the different types of NEMA TS-2 traffic controller assemblies or individual traffic control components used by the Department

**12.1.7** All manuals, documents and required software to realize full potential of component have been submitted

**12.1.8** Only minimal maintenance operations were necessary during the field testing

## **12.2 Maintaining Approval.**

**12.2.1** The Highway Operations Division Evaluations Section shall be notified each time any update or revision is made, and the changes and benefits of the change shall be submitted for approval. The Operations Support Division will determine if and to what extent a revision is to be placed into field operation and may fully re-evaluate the cabinet component with the revision.

**12.2.2** If the manufacturer makes any changes to an approved model to correct a non-NEMA compliant or safety issue, the Department shall be notified immediately. The manufacturer shall correct all existing equipment purchased by the Department either directly, by contract, or through agreement prior to the change being incorporated at the manufacturer's production level.

**12.2.3** A design change to an approved model shall require a submittal of documented changes. At the discretion of the Department, resubmission of the model for testing and evaluation may be required. Permanent addition or removals of component parts or wires, printed circuit board modifications, or revisions to memory or processor software, are examples of items that are considered to be design changes.

**12.3 Removal from Approval List.** NEMA TS-2 cabinet components will be removed from an approval list for, but not limited to, the following reasons:

**12.3.1** Changes in the NEMA TS-2 cabinet components or production process that fail testing and/or evaluation

**12.3.2** If three consecutive years elapse without furnishing the NEMA TS-2 cabinet component

**12.3.3** Performance of the NEMA TS-2 cabinet component no longer meets the intended purpose

**12.3.4** Recurring similar product failures indicative of a manufactures defect

**INDIANA DEPARTMENT OF TRANSPORTATION  
DIVISION OF OPERATIONS SUPPORT  
PRELIMINARY INFORMATION FOR PRODUCT MATERIAL EVALUATION**

Trade Name \_\_\_\_\_ Date \_\_\_\_\_

Manufacturer \_\_\_\_\_ Patented? Yes \_\_\_\_\_ No \_\_\_\_\_ Applied for \_\_\_\_\_

Address \_\_\_\_\_  
Street No (P. O. Box) City State Zip Code

Representative \_\_\_\_\_ Phone No ( ) \_\_\_\_\_

Address \_\_\_\_\_  
Street No (P. O. Box) City State Zip Code

Product Information \_\_\_\_\_  
\_\_\_\_\_

Materials Composition \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\*\* Is this product considered HAZARDOUS MATERIAL when disposing of non-used or surplus materials? Yes \_\_\_\_\_ No \_\_\_\_\_

\*\* What is the shelf life of this material? Years \_\_\_\_\_ Months \_\_\_\_\_ N/A \_\_\_\_\_

Recommended Use-Primary \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Recommended Use-Alternate \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Advantages and/or Benefits \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\*\* Materials specifications by manufacturer, installation/operation manual, maintenance manual, literature, test results, guarantee, hazardous material data sheets, plan, picture or sketch must be submitted with this form. In the case of electronic devices the schematic diagram, parts list, and parts layout diagram must be submitted for each printed circuit board within the device.

Meets following specifications:

AASHTO \_\_\_\_\_

ASTM \_\_\_\_\_

OTHER \_\_\_\_\_

Use by highway authorities or similar agencies in other states.

Agency	Years Used	Remarks
_____	_____	_____
_____	_____	_____
_____	_____	_____

\*\* Has product ever been evaluated by and rejected for use by a governmental agency?

Yes \_\_\_\_\_ No \_\_\_\_\_ If yes, by what agency and for what reason?

\_\_\_\_\_

\_\_\_\_\_

Will demonstration be provided? Yes \_\_\_\_\_ No \_\_\_\_\_

Availability: Seasonal \_\_\_\_\_ Non-seasonal \_\_\_\_\_ Delivery at site \_\_\_\_\_

After receipt of order, are quantities limited? Yes \_\_\_\_\_ No \_\_\_\_\_



\*\* Will FREE SAMPLES be furnished? Yes \_\_\_\_\_ No \_\_\_\_\_  
If yes, Quantity Furnished \_\_\_\_\_

\*\* If the sample is salvageable, do you desire to have it returned Yes \_\_\_\_\_ No \_\_\_\_\_

(Desired return of salvageable samples will be at the supplier's expense.)

(The manufacturer agrees upon the return of salvageable samples, such samples may be damaged or non-operable. Normal care will be taken that the samples, when returned, are in operable condition; INDOT, however, does not guarantee that the returned samples are operable.)

Will laboratory analysis be furnished? Yes \_\_\_\_\_ No \_\_\_\_\_

\*\* Approximate cost \_\_\_\_\_ Royalty Cost \_\_\_\_\_

When was the product introduced to the market? \_\_\_\_\_

This product is an alternate for what product? \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Will warranty be provided? Yes \_\_\_\_\_ No \_\_\_\_\_ If yes, for how long? \_\_\_\_\_

Background of company, including principal products \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

What offices of the Indiana Department of Transportation have been contacted?

\_\_\_\_\_

Additional Information \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

(Attach additional sheets as necessary)

Person furnishing information \_\_\_\_\_  
Name Title

Address \_\_\_\_\_  
Street No (P. O. Box) City State Zip Code

Items marked \*\* MUST BE RESPONDED TO or further consideration may not be given for this product.

Please mail this form to: Manager, Office of Traffic Engineering  
100 N. Senate Ave., Room N925  
Indianapolis, IN 46204-2249

If INDOT elects to evaluate your product/material - traffic signal equipment will be shipped to:

Electronic Technician Supervisor  
Indiana Department of Transportation  
6400 E. 30<sup>th</sup> Street  
Indianapolis, IN 46219-8222

While all other materials to be evaluated will be shipped to:

Traffic Evaluations Engineer  
Indiana Department of Transportation  
6400 E. 30<sup>th</sup> Street  
Indianapolis, IN 46219-8222